(Copy)

Phila^a 22nd Feb. 1855

Dear Sir

In reply to your favor of ~~yesterday~~ 21st Inst, I may state that I have none of the alloys ~~ready for use~~ as we are about commencing the preparation of them and shall progress as rapidly as they can be tested.

The boiler was not put up until about three weeks since, and before I could fire it for testing the alloys, it was necessary to have the premises ~~building~~ and ~~contents~~ insured (because I have some $5000 worth of books, collections & apparatus in the building. I met with unexpected ~~This I found considerable~~ difficulty, in accomplishing the insurance some offices declining it altogether, & fearing as that we would certainly explode the boiler & set fire to the building offering it ~~refusing to do it at all together~~, others at ~~for~~ exhibitant rates, and those which have taken it both on the building & contents ~~the insurance~~, requiring an alteration, ~~of the chimney where it passes through the floors~~.

These petty annoyances have lasted until within a few days, since which time we have been actively engaged in testing the satisfactory alloys in the boiler.

I enclose a table of the ~~the list of~~ alloys, modified since my last report, ~~tested~~ with the results of testing them both in my small apparatus & in the boiler.

~~I am now ready to proceed with the manufacture, and after the beginning, the supply can be hastened by extra effort, so that there shall be no cause for complaint of delay~~. Not a day however since that Report has passed in which the experiments to improve the character of the alloys for reliability have been intermitted.

I enclose the bill of Mess. J P Morris & Co. for the boiler and extra work. The former is correct, but I believe I ~~think~~ the latter should be $105. instead of $150. ~~for I have myself paid the Plumber &c.~~ Since the Department retained the proposals of J P Morris & Co, which I transmitted will you please forward the same or a copy that I may show it to them. My recollection is that I was to have the balance of $45. for sundry extra work, plumbing, a small furnace &c. I have myself paid for the introduction of water into the room, & am now preparing the ~~This~~ furnace. ~~I am now about to put up~~, and within for making the alloys. ~~a week I shall be able to commence making the alloys on a proper scale~~

(over on p. 3)

~~Respectfully Yours~~

Jacob Bigelow

~~Hon James Guthrie~~
~~Secretary of the Treasury~~

Results of Experiments on Fusible Alloys

Required Pressure in lbs	Corresponding Temperature	Fusing points of alloys tested in small apparatus	Pounds pressure by the Barometer guage tested in the boiler	
10	340	337-342-344-344	8-9½-13	×
20	360	360½-361½-362-362	20½-21	×
30	376	375½-376-376-376	29-29½-32½	×
40	387	387-387-387-387½-388		×
50	397			
60	306	303-303-306-307		×
70	314	312-313-313-314		×
80	321	322-322-322½		
90	328	327-327-327-329		
100	334	332-332-332½		
110	340	336-338-338½-339		×
120	346	345-345-346		
130	352	352½-353½-353		
140	357	357-358-358½		
150	362	362-363-364-364		×
160	367	367½-368½-369-369½		×
170				

It will be observed that the first 3 alloys have been tested in the boiler, and that they prove sufficiently near the required pressure to be employed practically. Most of the above are different alloys from those sent in the last table of Results and such as marked ×. A few of the above will be further modified to bring them nearer to the req^{d} temperatures. I am not satisfied with the 50 lb alloy but shall attain it soon. The same alloy can only be tested twice on the same day, since the boiler must be cooled down in order to solidify the melted alloy. To test a new alloy the boiler must be cooled below 212° and the guard wholly removed in order to replace the alloy in it. Altho' I am both anxious and active to have the alloys ready for use, yet it must be evident that I cannot progress more rapidly than I have done during the last week, since the boiler has been in action and that as long as we employ the boiler test, rapidity cannot be attained. If however, further experiments confirm the results so far indicated, I shall dispense altogether with the boiler test (except occasionally), because the small apparatus thus far is much more reliable in determining temperatures, and of course corresponding pressure.

Jas. B. Booth

(from p. 1). I have employed a common cast-iron pot for melting the alloys & believe it will prove better than the more costly crucibles. The only other expense will be for fuel for the boiler & melting, steel punches for marking the pressure on the bars of alloy, & cast-iron moulds for casting the alloys.

If the inquiry of the Dep^{t} indicate the least feeling that I am dilatory in preparing the alloys, I can only assure them that I have conscientiously & actively pushed forward the operation of discovering & making suitable alloys to the best of my ability, & that such shall be my endeavor as long as the subject is left in my hands. With larger means I might have accomplished the result at an earlier day, but I thought myself limited by the letter of instruction to execute my task with as much economy as practicable. I trust however that the manufacture of the alloys will now progress so rapidly as to admit of no ground of complaint.

I have the honor to be, dear sir,
your ob^{t} ser^{t}
Jas. B. Booth

Hon. James Guthrie
Sec^{y} of the Treas^{y}
Washington D.C.

1855

Feb 2 Encl 4

J.C.B. to Sec. Treas.